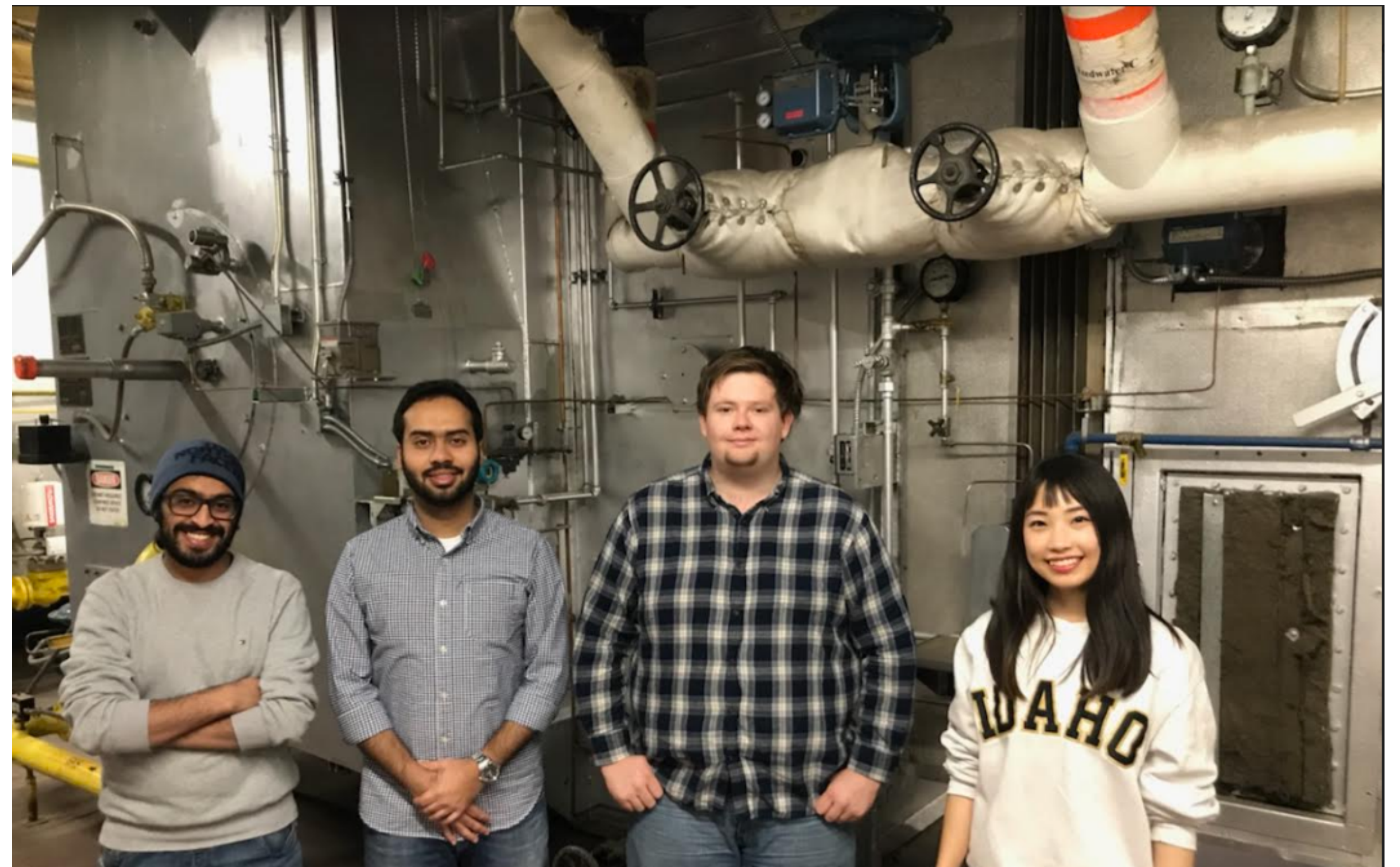




University
of Idaho



UI STEAM PLANT

ROLLING TIMBER II

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OUTLINE

1. Background

2. Problem definition & Goal

3. Previous team

4. Fuel mass flow measurement

System Diagram

Final Design (Mechanical components)

Final Design (Electrical components)

5. Fuel moisture contents measurement

System Diagram

Final Design (Mechanical components)

Final Design (Electrical components)

6. Recommendations

7. Project management & Budget

BACKGROUND

- Operation and control of biomass boilers has been primarily done by plant operators manually.
- The measurement of fuel mass flow and the fuel moisture content in real time has been identified as the biggest challenge.



PROJECT GOAL

- The goal of our project is to measure and record the primary fuel variables for the wood fired boiler at the UI Energy Plant to more efficiently supply fuel.

DELIVERABLES

- To be able to measure and record:
 - Fuel mass flow rate
 - Fuel moisture content
 - Fuel air mass flow rate (?)
- To achieve an automated boiler control as the end goal

PREVIOUS TEAM

- Rolling Timber I :

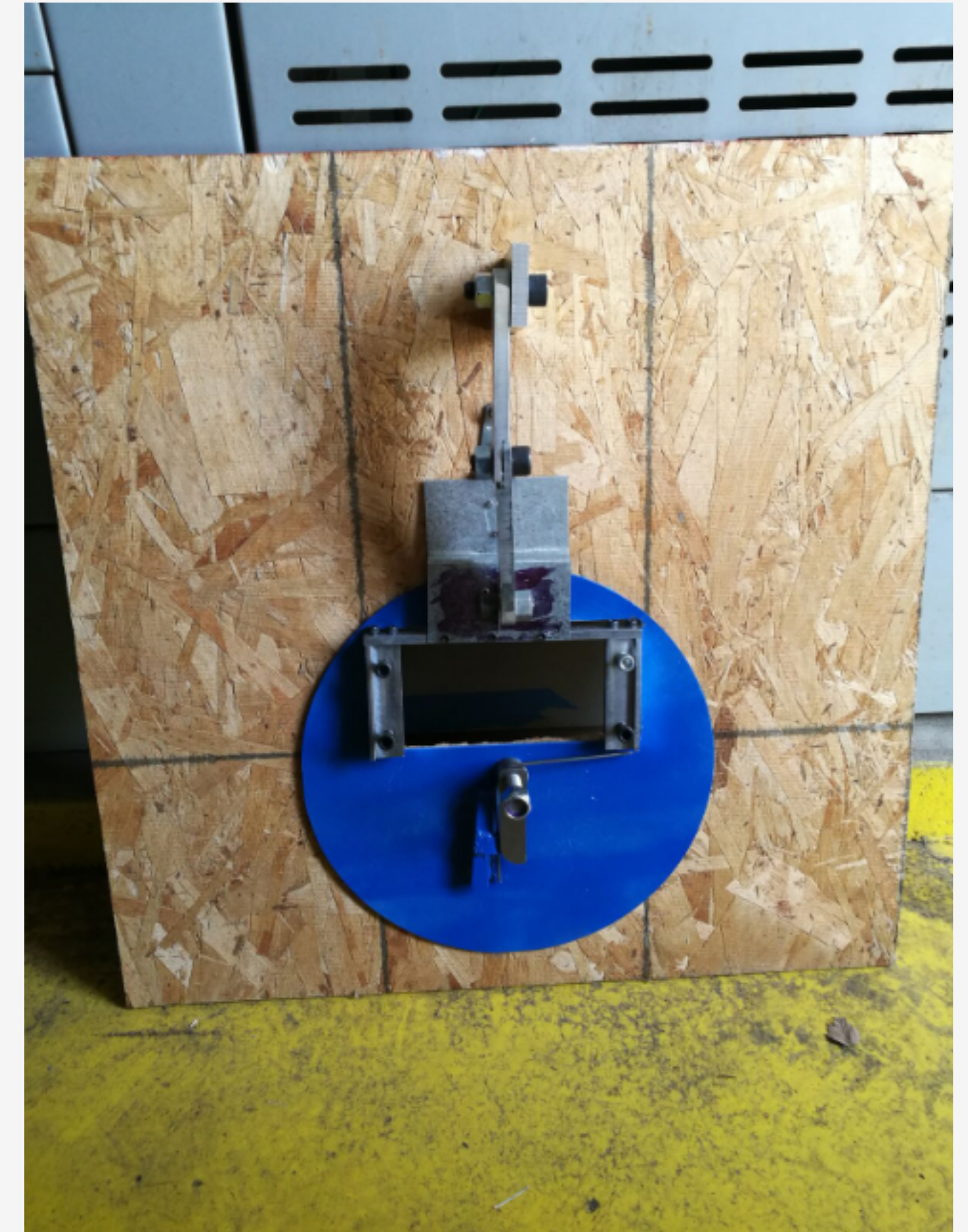
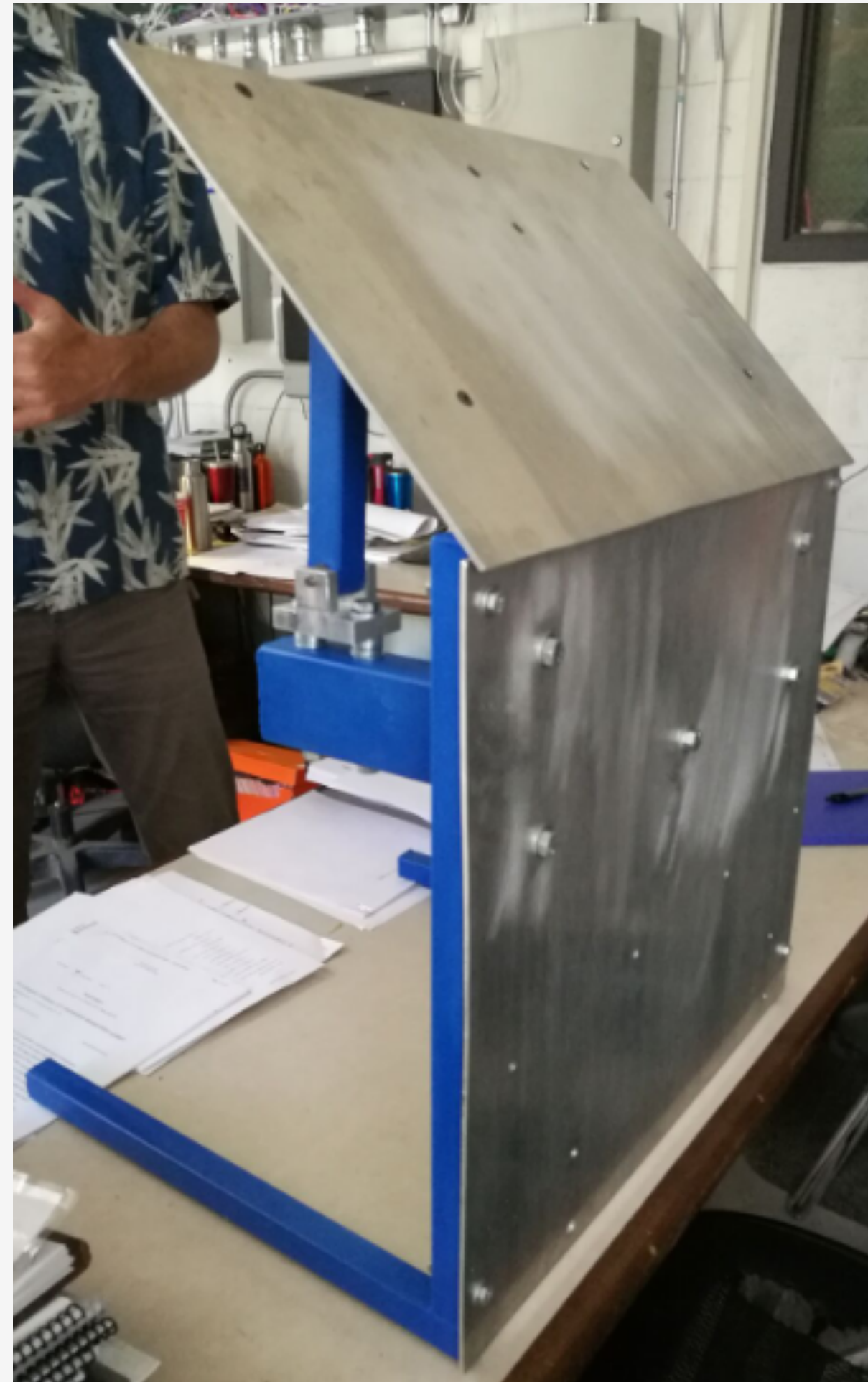
Preliminary design concept and prototype

- Concept of “impact plate”

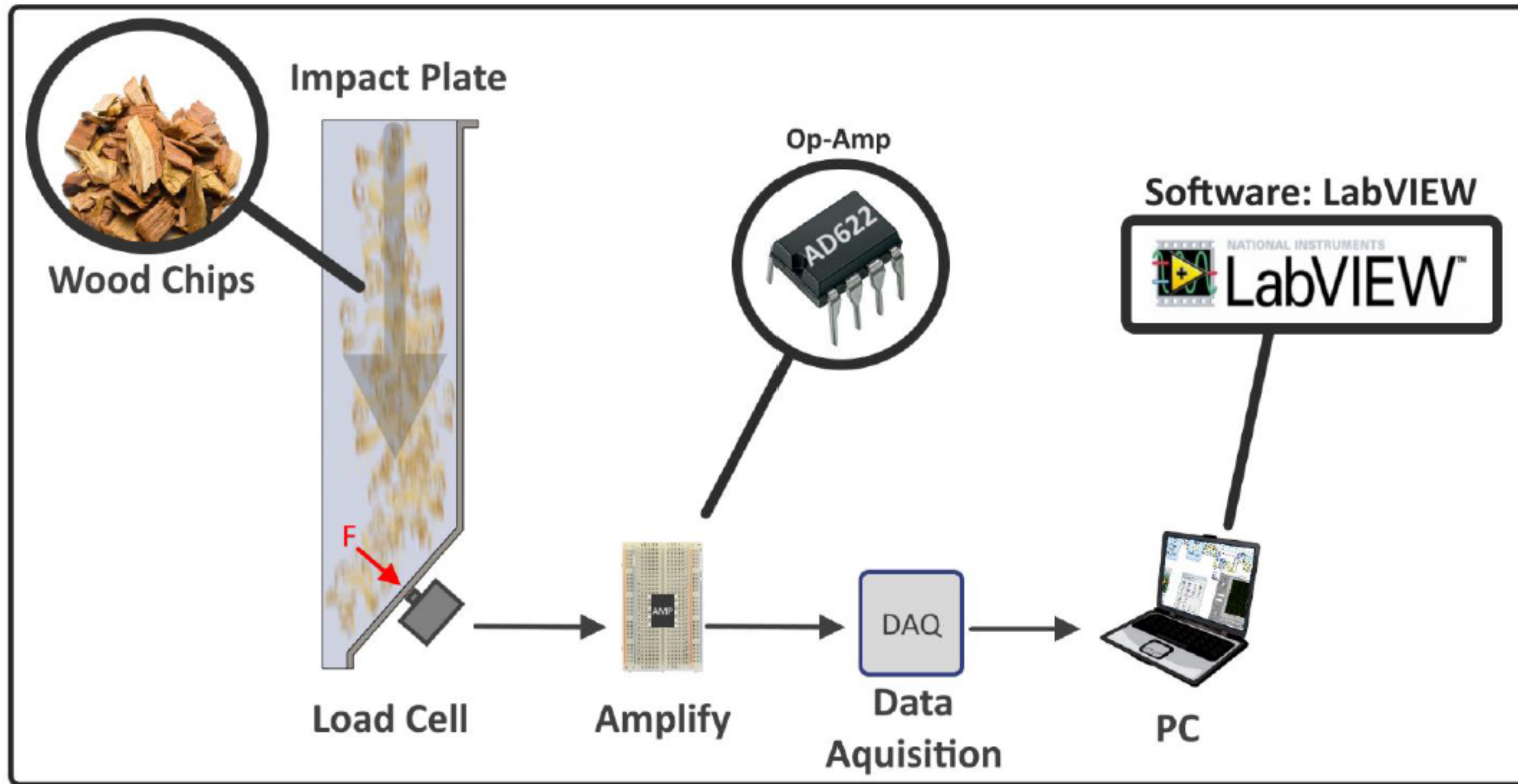
(Mass flow measurement)

- Concept of “sliding plate”

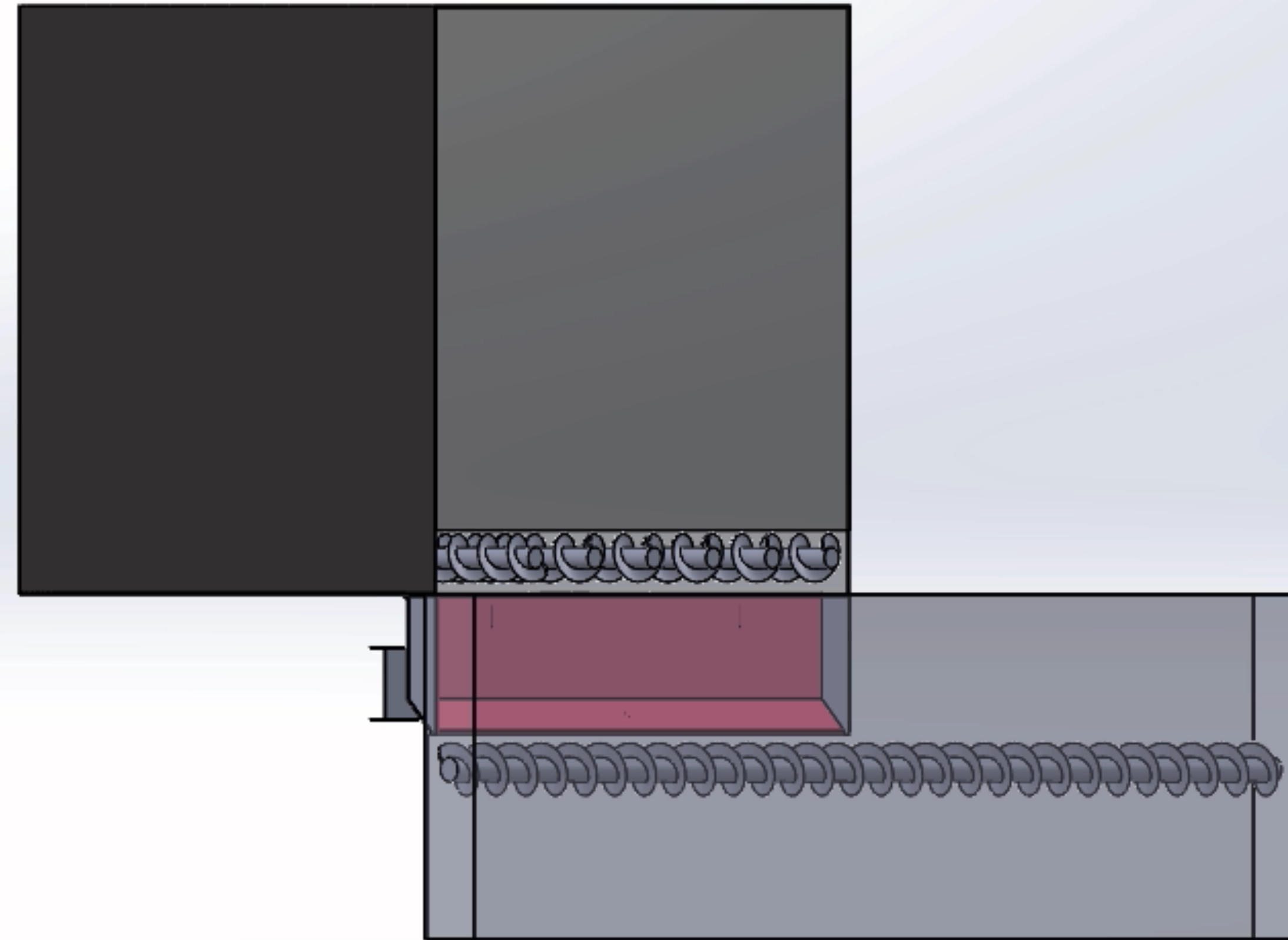
(Moisture contents measurement)



FUEL MASS FLOW MEASUREMENT



FUEL MASS FLOW FINAL DESIGN CONCEPT



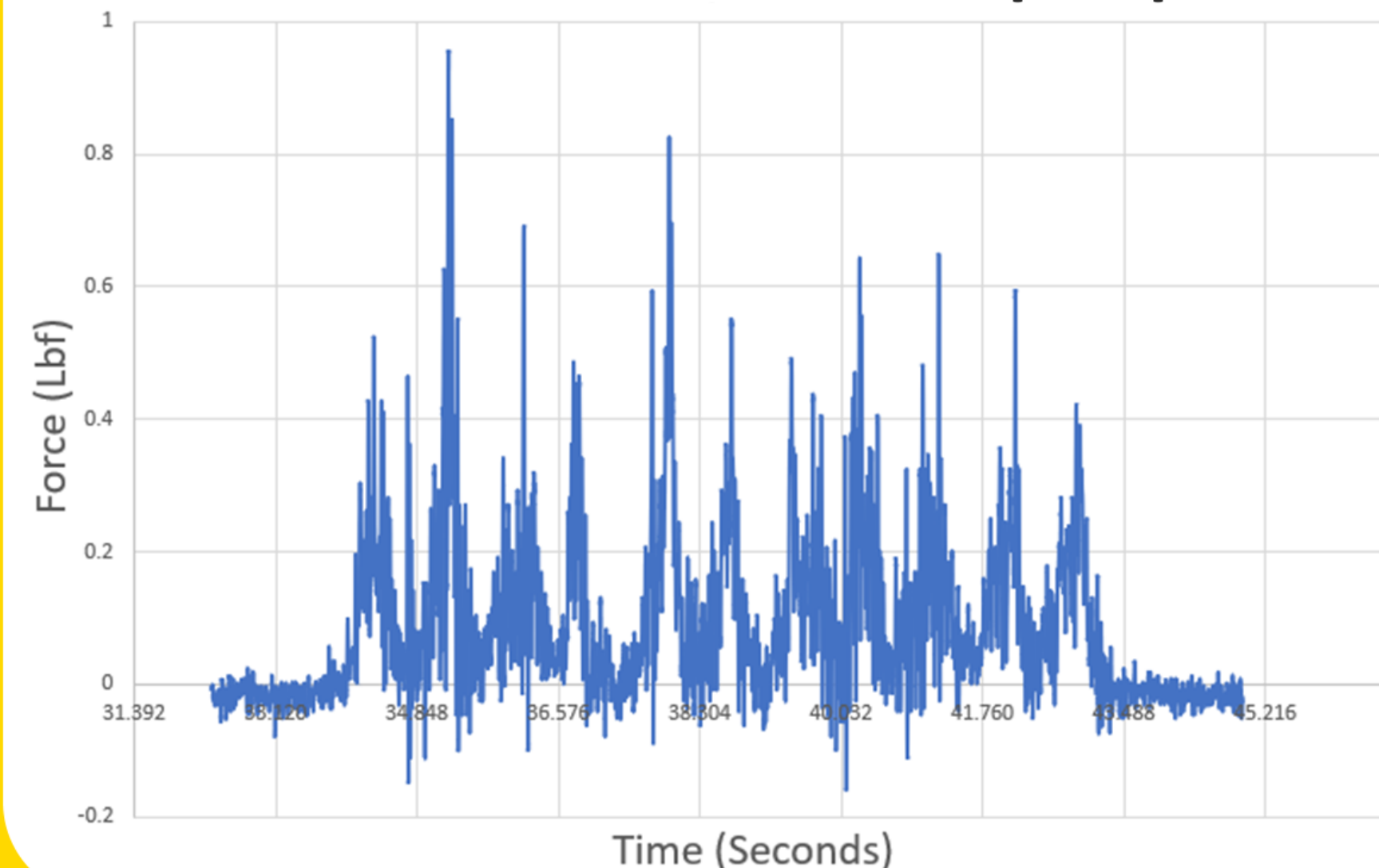
FUEL MASS FLOW PROTOTYPE



- **Ideology:** Begin with a simple design and increase complexity until functionality is achieved.
- **Lab Prototype:** Modeled to fit within the constraints of the steam plant.
- **Prototype Scale:** Vertically our prototype is identical to plant conditions. It was made 3 feet wide instead of 6 feet wide to fit in our lab.
- **Result:** After careful calibration our system is able to record the magnitude of wood chip impacts flowing over the system.
- **Sensitivity:** Our system is extremely sensitive to outside vibrations as small as footsteps near the equipment.



Lab Test Results: Wood Chip Impacts



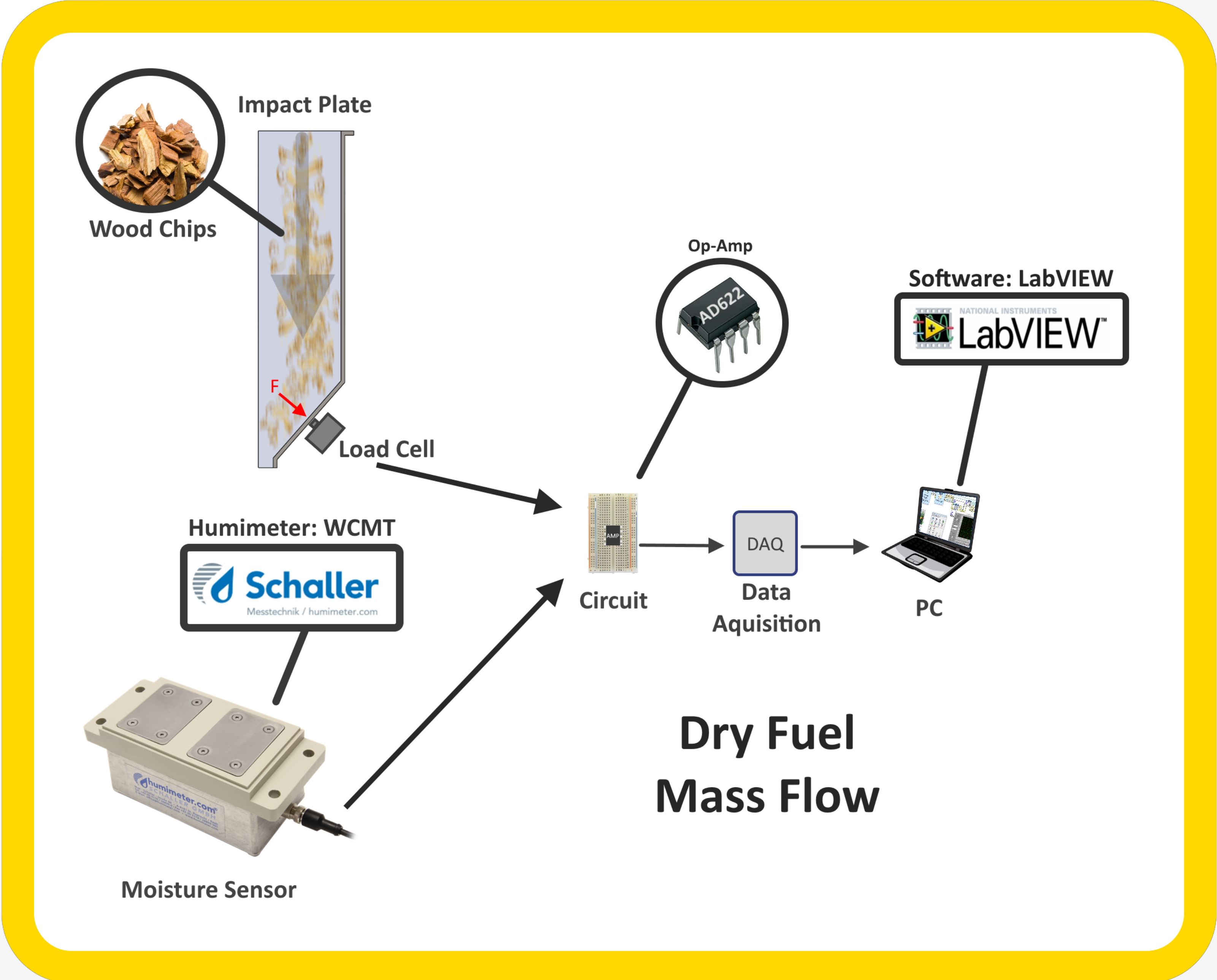
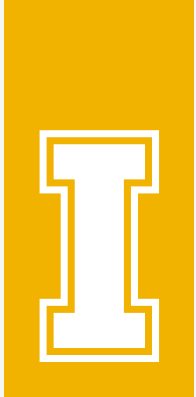
FUEL MOISTURE CONTENT MEASUREMENT



- Mass Flow of dry fuel is desired.
- Wood chips have a high moisture content that varies widely (5-60%)
- Mass flow sensor alone measures mass of moisture and fuel impacting plate.
- With the addition of a moisture sensor we are able to subtract the mass of water from mass flow calculations.



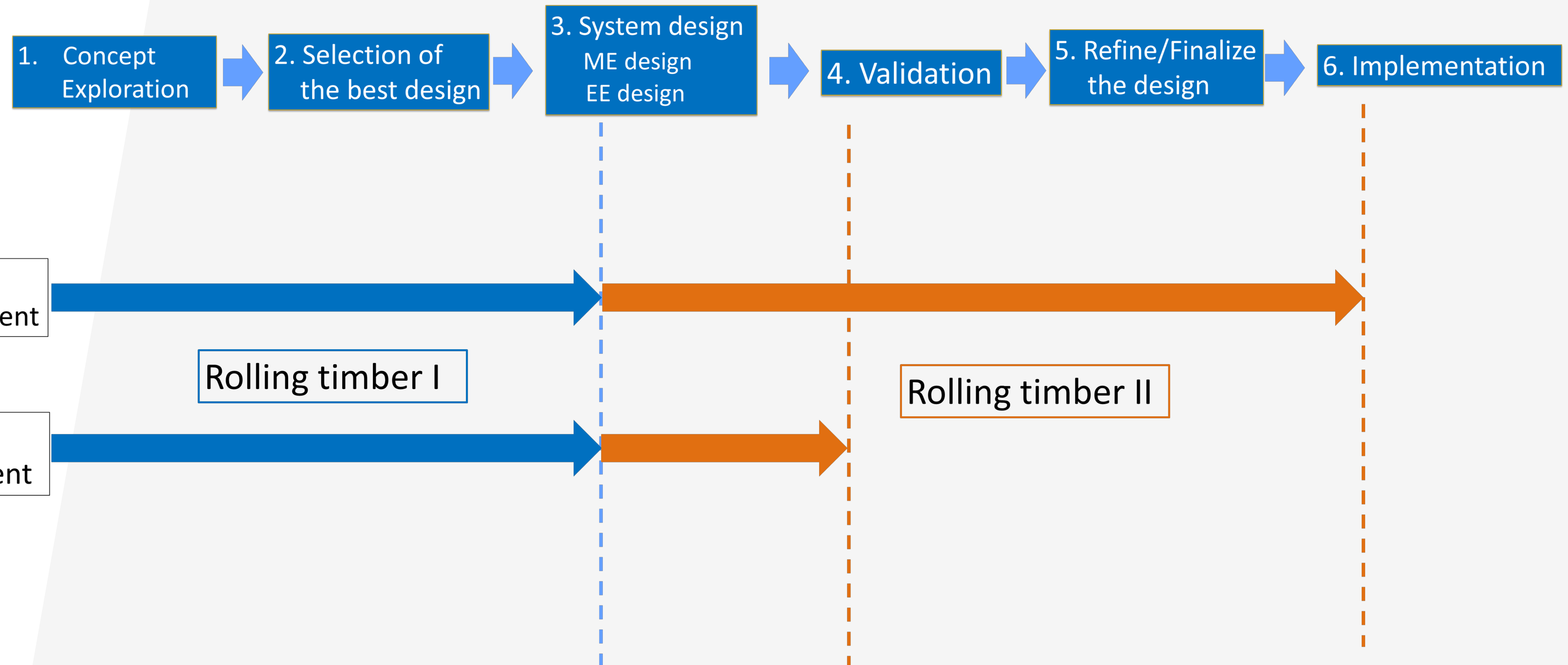
FUEL MOISTURE CONTENT MEASUREMENT



RECOMMENDATIONS

- Provide recommendations with respect to the adoption and use of your design
- Remained tasks for the future team?

OVERALL OUTCOME & BUDGET



*Total expenditure: \$2,952 (Summer & Fall 2018)

Questions?